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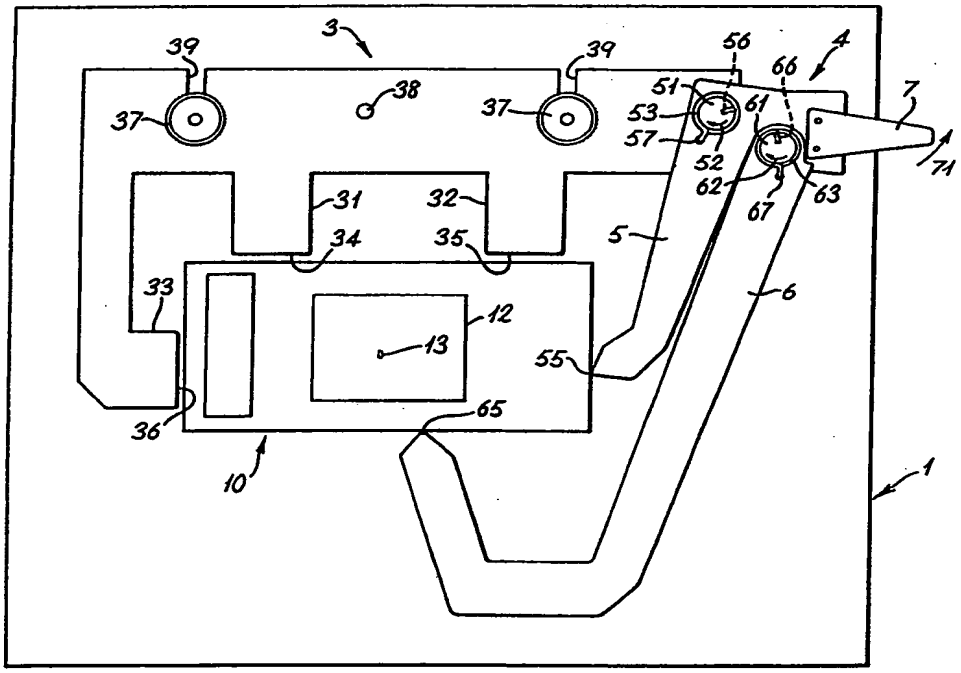


(57) Abstract

A microscope slide clip includes a slide abutment (3) for a microscope stage and a slide clamping arrangement (5, 6) to clamp a slide against the abutment, the clamping arrangement including means effective to push and clamp the slide in two phases (55, 65), each phase in a respective direction against the abutment, the means to push and clamp the slide in two phases pushes in a respective direction against the abutment and clamps to a respective degree, one phase achieving a clamping effect of a lesser respective degree before the other comes into clamping effect. The slide abutment may be securable to a microscope stage or part of a microscope stage.

## + DESIGNATIONS OF "SU"

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# MICROSCOPE SLIDE CLIP

This invention relates to slide clips for microscopes.

The slide clip holds the microscope slide on the microscope stage to permit the slide to be positioned accurately for movement by the stage gearing, under manual or machine control. For many uses it is now important to be able to view a small part of a slide on the stage, to remove the slide and later replace the slide so that the same small part can easily be placed on the optic axis. In particular medical screening techniques require that parts of a slide selected during a preliminary checking stage can be accurately identified during a subsequent more intensive checking stage, possibly on a different instrument. Various slide clips and stage constructions have been proposed but these are either costly or insufficiently accurate for users' needs. It has also been proposed to place marks on the slide to identify the small part of interest but this is not very practical and the marks can obscure the slide.

It is an object of the present invention to provide a microscope slide clip which mitigates these shortcomings.

According to the invention there is provided a microscope slide clip including a slide abutment for a microscope stage and a slide clamping arrangement to clamp a slide against the abutment, the clamping arrangement including means effective to push and clamp the slide in two phases, each phase in a respective direction against the abutment.

Preferably said means to push and clamp the slide in two phases effects pushing in a respective direction against the abutment and clamping to a respective degree, one phase achieving clamping effect of a lesser respective degree before the other comes into clamping effect.

The slide abutment may be securable to or part of a microscope stage.

The abutment may be formed in the shape of an inside corner to receive the slide. The abutment may be formed by several localised guide surfaces for slide edges. The guide surfaces may be parts of one body or separate elements.

The clamping means may be two levers pivotally linked, one lever having a pivot on said abutment and the other having a pivot on the one lever. There may be spring loading on the lever pivots, the spring loading on said other lever being less than on said one lever, both spring loadings to urge the respective levers for said pushing and clamping effect. Said one lever may have a clamping control member operable to move the levers away from the abutment. The spring loading on the levers may be through the pivots. The spring loading may be springs around the respective pivots. The levers may have individual pivots not on the abutment or another lever.

According to the invention there is also provided a method of positioning a microscope slide on a microscope stage and after removal repositioning on the or another stage including urging a slide against an abutment on a microscope stage for positioning in two intersecting directions, urging in one of said two directions and holding against said abutment still allowing movement in the other of said two directions and urging said slide in said other of said two directions while the slide is so-held by said urging in the first direction and then holding against said abutment in the second direction whereby an area of interest is repositioned on a specified optic axis.

The method urges said slide to avoid tilting in the abutment or excessive pressure on the slide.

The method may include releasing spring loaded operated means to exert said first and second urging in order and causing or permitting respective elements of said spring loaded operating means to exert a lesser urging in said first direction.

At least one of the and the another stages may be in an automatic slide scanning apparatus.

The method may include positioning a slide on a first stage and repositioning the slide on a second stage.

According to a particular aspect of the invention there is provided a positioning and repositioning microscope slide clip including an L-shaped abutment to define slide position and a compound slide clamp of spring-urged levers one pivotted on another and the another on the abutment, the arrangement being such that the one lever, before the another, urges a slide for positioning against the longer limb of the L allowing movement along said longer limb and the another lever urges said slide along said longer limb direction for positioning against the shorter limb.

In general the urging of the slide in the second direction does not start until the slide is lightly clamped against the abutment by the completed urging of the slide in the first direction.

Embodiments of the invention will now be described with reference to accompanying drawing which is a plan view of a microscope slide clip embodying the invention.

A microscope stage is generally indicated at 1 and a microscope slide positioned on the stage at 10. Area 12 on slide 10 represents a specimen and region 13 a region of interest in the specimen. In using the slide a region 13 will be identified with the slide on the stage and the slide then removed and later replaced on the stage for further examination. It is important that a user can be sure that a slide is repositioned on such replacement so that a region of interest is in the same place as before, usually on the optic axis of the instrument, as otherwise it can be impossible to find the region of interest again.

The invention provides an abutment 3 of special form and a clamping arrangement 4 of compound levers 5 and 6 to produce accurate repositioning of a slide.

Abutment 3 is generally L-shaped to receive and position a slide in the corner of the L. The abutment has projections 31, 32, 33 with respective slide positioning surfaces 34, 35, 36. Two surfaces 34, 35 are on the long limb of the L, and one, 36, on the short limb. The surfaces are arranged to permit easy movement of the slide along them but also to give a well-defined position. Suitable material for the abutment includes metal such as steel and hard, low-friction plastics. The abutment 3 is attached to the stage 1 by a pivot pin 38 and locking screws indicated at 37. It may be that the abutment is to be removable in which case there must be a secure and firm attachment when in place. The abutment is shown as being in one piece to provide the guide surfaces and this is a convenient form but the guide surfaces could be provided by separate parts. The abutment needs to be alignable with reference axes of a microscope or other device on which it is used. To do this the clip can be moved on pivot pin 38 using slots 39 and then locked with screws 37.

Clamping arrangement 4 includes two levers 5 and 6. Lever 5 is pivotted on to the abutment at a pivot 51 and lever 6 is pivotted onto lever 5 at pivot 61. These pivots are conveniently pins in bushes on the levers to provide a pivot that is easy to turn on but does not wobble, particularly as lever 6 is pivotted on lever 5. Each pivot is spring loaded to turn the levers in the directions shown by the arrows 52, 62. Conveniently the spring load is a spring of coil form around each pivot, respectively 53, 63, with one end of the spring housed in a bore 56 in the pivot and the other end in a bore 57 in the lever, the coil being wound to produce the required sense of turning the lever. Clearly springs of other form could be used, even resilient plastics bodies could be used instead of distinct springs, for example a so-called "living hinge" of polypropylene. The levers could be mounted and pivotted in other ways, as will be apparent to those skilled in the art, provided the limited clamping to still allow movement before clamping from another direction is present.

An operating member 7 is attached to lever 5 for use by an operator. Conveniently member 7 is shaped for thumb-action.

The levers are conveniently shaped as shown to bear on adjacent sides of a slide and, by the spring action, push the slide towards the abutment. Again metal or plastics materials are suitable. Instead of levers other mechanisms to achieve the specified action could be used.

An important feature is in the sequence and degree or relative size of the urge applied by the levers. The spring 63 acting on lever 6 produces less urge by lever 6 than the spring 53 acting on lever 5 produces by lever 5.

The relation between the points of action on the slide of the abutments and the levers is important. As shown two guide surfaces are provided in one direction and one in the other. The lever urging the slide against the two surfaces preferably acts near a point mid-way between these two surfaces when the slide is urged against them. This is found to give the most reliable positioning without tilting or excess pressure on the fragile slide. The other lever and abutment also require great care. Preferably this lever should act near to the outward end of the short side of the slide and the abutment should be large enough to squarely locate the short side of slide and positioned to avoid the lever pivotting the slide on part of the abutment. Again excessive force must be avoided. The levers and abutment must not too far above the stage to avoid contact with the objective of an instrument.

The action of the arrangement is as follows. Starting from the position in the drawing member 7 is moved by an operator in the direction of arrow 71. This swings the clamping arrangement of both levers on pivot 51 to release slide 10. The slide is removed, possibly for treatment in a manner which is not relevant to this description. The levers remain away from the slide position either by the operator holding the member 7 or by an over-centre action of any convenient form (not shown). When a slide is to be placed on the stage 1 the levers are moved clear of the slide position if they have been returned.

The slide returned to the stage is placed near to the abutment but not necessarily touching it. The member 7 is used to bring the levers back towards the slide or to release the levers for spring urged return. When one or more of the levers contacts or approaches the slide the member can be released, if not already released. The slide can move freely towards the abutment and is pushed in the direction towards surfaces 34, 35 by lever 6 and towards surface 36 by lever 5. The levers are sized and arranged so that lever 6 starts to push the slide to surfaces 34, 35 before lever 5 pushes the slide to surface 36. Other sequences are possible.

As the spring loading on lever 6 is less than that on lever 5 when lever 6 has pivotted to push the slide to surfaces 34, 35 lever 5 continues to pivot on pivot 51 and can push the slide along the surfaces 34, 35 until it reaches surface 36. The spring loading on lever 6 is arranged to be low enough not to clamp the slide against surfaces 34, 35 to prevent movement towards surface 36 but does prevent movement away from these surfaces.

In this way the slide is returned to the original position on the stage of the same microscope or another instrument, which may not be a microscope, with sufficient accuracy to again have the region of interest 13 in view.

References to an operator include operation by a robot or other mechanism as well as by a human operator.

Existing stages usually use vernier controls with an accuracy of 50 to 100 microns and an inaccurate slide clip with an accuracy of 30 microns. For some modern microscope applications this is not good enough. Encoders and similar techniques are now becoming available which permit a stage relocation of about ± 5 microns, and a slide clip described above can reposition slides to within about 5 microns. The slide clip described therefore provides a useful improvement for microscope use.

The slide clip techniques described above can be particularly valuable for repeated examination of a slide, for example in screening procedures when a slide is first scanned, possibly by a scanning machine, for areas of interest which areas are later examined in more detail, possibly by a more experienced operator.

CLAIMS

1. A microscope slide clip including a slide abutment for a microscope stage and a slide clamping arrangement to clamp a slide against the abutment, the clamping arrangement including means effective to push and clamp the slide in two phases, each phase in a respective direction against the abutment.

2. A microscope slide clip according to Claim 1 in which said means to push and clamp the slide in two phases effects pushing in a respective direction against the abutment and clamping to a respective degree, one phase achieving clamping effect of a lesser respective degree before the other comes into clamping effect.

3. A slide clip according to Claim 1 in which the slide abutment is securable to a microscope stage.

4. A slide clip according to Claim 1 in which the slide abutment is part of a microscope stage.

5. A slide clip according to Claim 1 in which the abutment is formed in the shape of an inside corner to receive the slide.

6. A slide clip according to Claim 1 in which the abutment is formed by several localised guide surfaces for slide edges.

7. A slide clip according to Claim 6 in which the guide surfaces are parts of one body or separate elements.

8. A slide clip according to Claim 1 in which the clamping means includes two levers pivotally linked, one lever having a pivot on said abutment and the other having a pivot on the one lever.

9. A slide clip according to Claim 8 in which there is spring loading on the lever pivots, the spring loading on said other lever being less than on said one lever, both spring loadings to urge the respective levers for said pushing and clamping effect.

10. A slide clip according to Claim 9 in which said one lever has a clamping control member operable to move the levers away from the abutment.

11. A slide clip according to Claim 9 in which the spring loading on the levers is through the pivots.

12. A slide clip according to Claim 9 in which the spring loading is springs around the respective pivots.

13. A slide clip according to Claim 8 in which the levers have individual pivots not on the abutment or another lever.

14. A method of positioning a microscope slide on a microscope stage and after removal repositioning on the or another stage including urging a slide against an abutment on a microscope stage for positioning in two intersecting directions, urging in one of said two directions and holding against said abutment still allowing movement in the other of said two directions and urging said slide in said other of said two directions while the slide is so-held by said urging in the first direction and then holding against said abutment in the second direction whereby a region of interest is repositioned on a specified optic axis.

15. A method according to Claim 14 including urging said slide to avoid tilting in the abutment or excessive pressure on the slide.

16. A method according to Claim 14 including releasing spring loaded operated means to exert said first and second urging in order and causing or permitting respective elements of said spring loaded operating means to exert a lesser urging in said first direction.

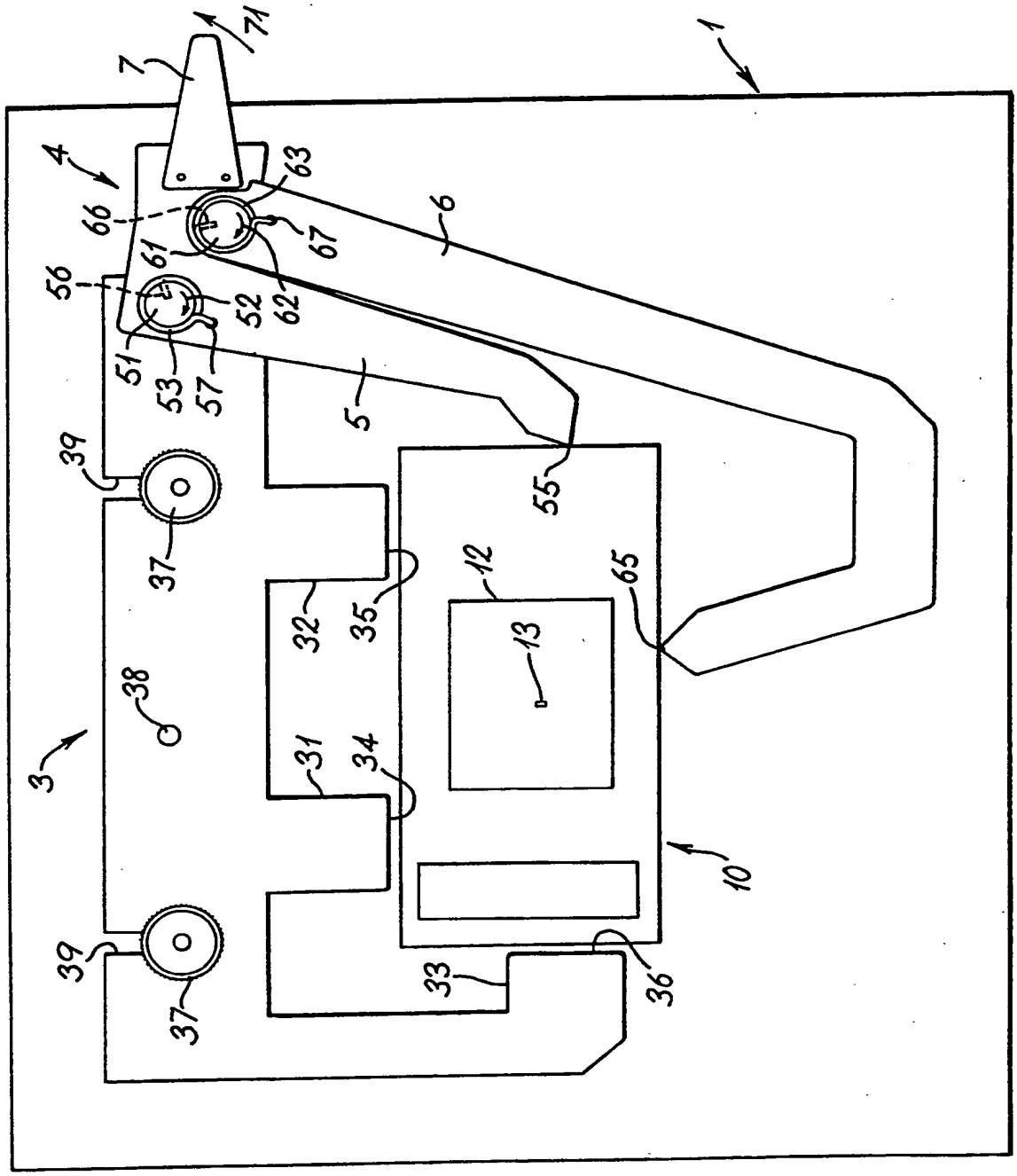
17. A method according to Claim 14 in which at least one of the and the another stages is in an automatic slide scanning apparatus.

18. A method according to Claim 14 include positioning a slide on a first stage and repositioning the slide on a second stage.

19. A positioning and repositioning microscope slide clip including an L-shaped abutment to define slide position and a compound slide clamp of spring-urged levers one pivotted on another and the another on the abutment, the arrangement being such that the one lever, before the another, urges a slide for

positioning against the longer limb of the L allowing movement along said longer limb and the another lever urges said slide along said longer limb direction for positioning against the shorter limb.

20. A microscope slide clip according to Claim 19 in which the urging of the slide in the second direction does not start until the slide is lightly clamped against the abutment by the completed urging of the slide in a first direction to position the slide against the longer limb.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# INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 91/01551

## I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 G02B21/34

## II. FIELDS SEARCHED

Minimum Documentation Searched[7]

| Classification System | Classification Symbols |
|---|---|
| Int.Cl. 5 | G02B |

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

## III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

| Category * | Citation of Document, [11] with indication, where appropriate, of the relevant passages [12] | Relevant to Claim No.[13] |
|---|---|---|
| A | DD,A,222 431 (VEB CARL ZEISS JENA) 15 May 1985<br>see abstract; figure 1<br>see page 4, line 7 - line 18 | 1 |
| A | US,A,3 951 512 (W.E. TOLLES) 20 April 1976<br>see column 2, line 15 - column 2, line 26; figure 9<br>see column 3, line 7 - column 3, line 32 | 1 |
| A | DE,A,3 221 186 (MANNESMANN AG) 1 December 1983<br>see abstract; claim 3; figure 1 | 1 |
| A | US,A,3 848 963 (T.H. PECK) 19 November 1974<br>see abstract; figure 1 | 1 |
| A | DE,A,3 110 366 (OLYMPUS OPTICAL) 14 January 1982<br>see abstract; claim 2; figures 1,2 | 1 |

* Special categories of cited documents :[10]

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## IV. CERTIFICATION

| Date of the Actual Completion of the International Search | Date of Mailing of this International Search Report |
|---|---|
| 19 DECEMBER 1991 | 10. 01. 92 |
| **International Searching Authority** | **Signature of Authorized Officer** |
| EUROPEAN PATENT OFFICE | VAN DOREMALEN J.C. |

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# ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. GB 9101551 SA 51160

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 19/12/91
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| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| DD-A-222431 | | None | |
| US-A-3951512 | 20-04-76 | None | |
| DE-A-3221186 | 01-12-83 | None | |
| US-A-3848963 | 19-11-74 | DE-A- 2218156 | 21-12-72 |
| DE-A-3110366 | 14-01-82 | US-A- 4407570 | 04-10-83 |